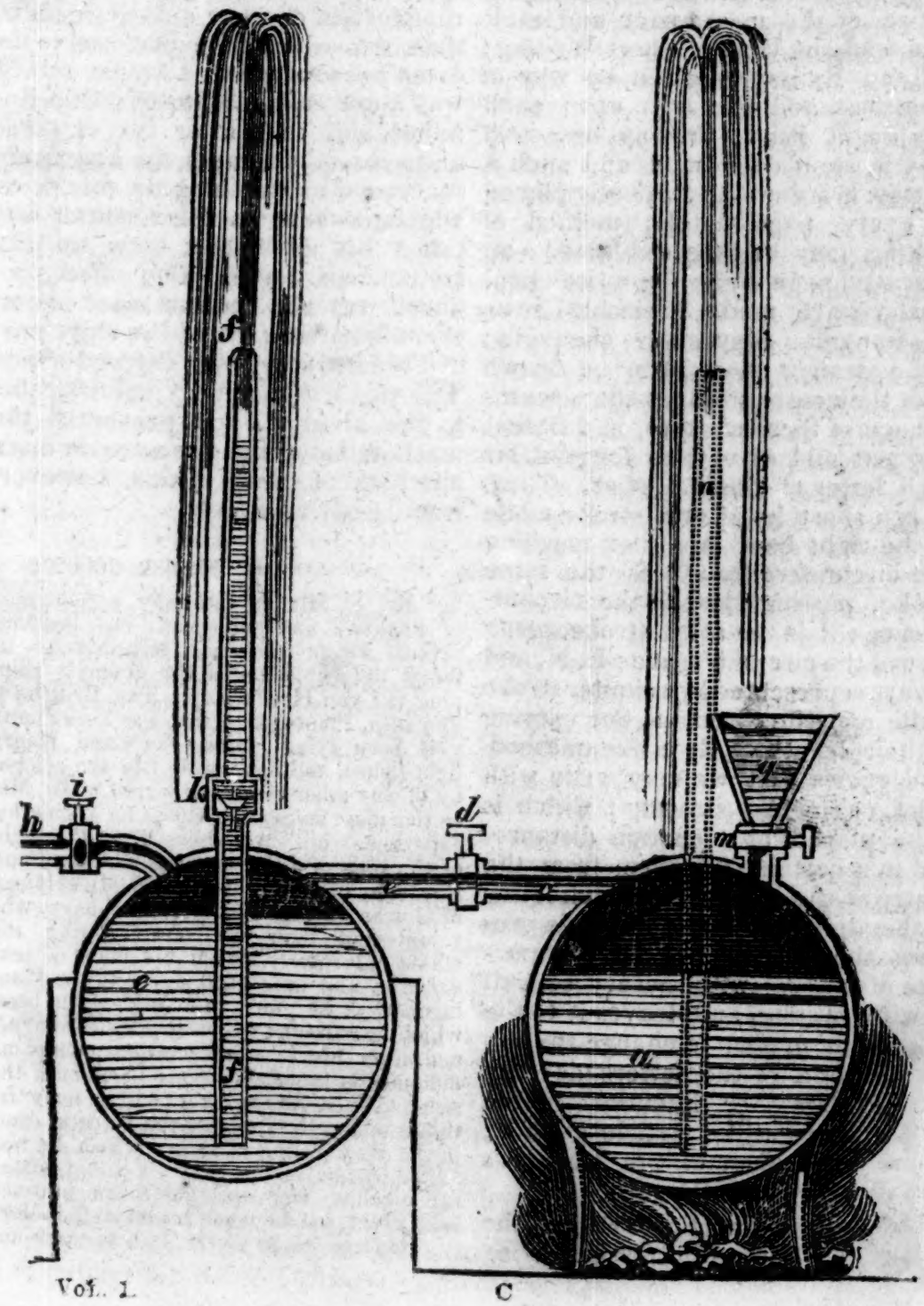
MECHANICS' MAGAZINE,
Museum, Register, Journal and Gazette.

"The most valuable gift which the Hand of Science has ever yet offered to the Artisan." *Dr. Birkbeck.*

No. 3. Am. Ed.] SATURDAY, FEBRUARY 19, 1825. [Price $4 per ann.

"Theoretical and practical men will most effectually promote their mutual interests, not by affecting to despise each other, but by blending their efforts; and an essential service will be done to mechanical science, by endeavouring to make all the scattered rays of light they have separately thrown upon this region of human knowledge converge to one point."——*Dr. Olinthus Gregory.*

LORD WORCESTER'S STEAM ENGINE.



ILLUSTRATIONS OF THE MARQUIS OF WORCESTER'S CENTURY OF INVENTIONS.

No. 4. The sort of cipher here referred to was the subject of much conjectural speculation (see Gent.'s Mag. vol xviii. p 55) till the ingenious writer of the article Cipher, in Rees's Cyclopædia, discovered, among the Harleian MSS, a paper in the hand writing of the Marquis of Worcester, which is supposed to contain a full specification of the invention. It is entitled "An Explanation of the most exact and most compendious Way of Short Writing; and an Example, given by way of Questions and Resolves upon each significant Point, proving how and why it stands for such and such a Letter, in order alphabetically placed in every page." His method of writing may be thus explained: an engraved page is given to write upon, in which are made horizontal rows of octangular squares or chequers; and a straight line is to be drawn from the centre towards the circumference of these squares, in different positions and of various lengths, for each letter of the alphabet. Thus, A is a short horizontal stroke made to the right hand, and not touching the circumference; I is the same stroke, passing close to the circumference; R is the same stroke, going beyond the circumference; E, N, and W, are represented by a similar stroke in the opposite direction, but varying in their lengths. By a like method, he suggests that we may write with a dot, or single point only; which is to be placed at a certain distance, and in a certain direction, from the centre of the octagon, for each letter of the alphabet. The Marquis proposes this contrivance for the purpose of writing with secrecy as well as with brevity, and leaves it to the will of any person to change the value or name of the letters as may suit his fancy or intention.—Vide Rees's Cyclopædia, article Cipher; where a specimen of the Marquis's invention is given.

No. 6. Does not this suggest the idea of the telegraph for conveying dispatches over great distances in a short time? and

No. 7. The universal telegraph, for day and night signals, invented by Lieutenant-Colonel Pasley, of the Royal Engineers?—S. R.

Nos. 9, 10, and 11, point evidently to the invention of the torpedo.—The following account of its application, in modern times, is taken from the "National Register," English newspaper, of the 12th September, 1813. The invention is American, and the account also American. It may, perhaps, be in the recollection of some of your readers, that, some little time previous to the event here recorded, a similar attack was made on his Majesty's ship Ramilies, and that, after two or three unsuccessful attempts, the Americans succeeded in attaching the machines, which, as soon as the operator had taken his departure, blew up with tremendous force. The effect produced was the destruction of almost the whole fore part of the ship, part of the cutwater being carryed away. The tide was then very unfavourable to the attempt, and prevented the machine being fixed so as to do more mischief. I speak of this, however, from recollection only.

"Norfolk, July 27th.

"Mr. E. Mix, of the navy, a gentleman of integrity and enterprise, has been for several weeks preparing torpedoes to attempt the explosion of the enemy's shipping in Lynn Haven Bay. The British 74-gun ship, Plantagenet, that has for a month past been lying abreast of Cape Henry light-house, and has rarely had the company of any other vessel, appeared to Mr. Mix as the most favourable object for trying his experiment on. Accordingly, on the night of the 16th of July, accompanied by Capt. Bowman, of the Salem, and Midshipman M'Gowan, of the United States navy, who volunteered their assistance during the whole enterprise, he left his place of rendezvous, and proceeded down to the Plantagenet, of 74 guns, in a large open boat, which he calls the "Chesapeak's Revenge," and, from previous observations, found no difficulty in ascertaining the position of the ship. When he had got within forty fathoms of her, he dropped the torpedo over, in the very instant of doing which he was hailed by one of the enemy's guard-boats; the machine was speedily taken into the boat again, and he made his way off in safety. On the night of the 19th he made an-

other attempt, and was again discovered ere he could accomplish his purpose. On the night of the 20th he succeeded in getting within fifteen yards of the ship's bow and directly under her jib-boom: there he continued making his preparations for fifteen minutes, when a centinel from the forecastle hailed, 'Boat, ahoy!' and he had to decamp. The centinel not being answered, fired his musket, which was followed by a rapid discharge of small arms. Blue lights were made to find out the boat, but failed; they then threw rockets in different directions, which illuminated the water for a considerable width as far as they were thrown, and succeeded in discovering the position of the nocturnal visitor, when the ship commenced a rapid fire of heavy guns, slipped her cables, and made some sail, while her boats were sent in pursuit; the daring intruders, however escaped unhurt. The visits were repeated on the nights of the 21st, 22d, and 23d, without success, as the ship, having taken alarm, changed her position every night. On the night of the 24th, however, Mr. Mix succeeded in finding her out, and having taken his position, within 100 yards distant, in a direction with her larboard bow, he dropped the fatal machine into the water, just as the centinel was crying 'all's well.' It was swept along by the tide, and would have completely effected its errand but for a cause not to be named here, but which may easily be guarded against in future experiments—it exploded a few minutes too soon. The scene was awfully sublime; it was like the concussion of an earthquake, attended with a sound louder and more terrific than the heaviest peal of thunder. A pyramid of water, fifty feet in circumference, was thrown up to the height of thirty or forty feet; its appearance was a vivid red, tinged at the sides with a beautiful purple. On ascending to its greatest height it burst at the top with a tremendous explosion, and fell in torrents on the deck of the ship, which rolled into the yawning chasm below, and nearly upset. Impervious darkness again prevailed. The light occasioned by the explosion, though fleeting, enabled Mr. Mix and his companions to discover that the fore-channel of the ship was blown off, and a boat, with several men in her, which lay alongside, was thrown up in the dreadful convulsion of the water. Terrible indeed must have been the panic of the ship's crew, from the noise and confusion which appeared to our adventurers to prevail on board, and they are certain that nearly the whole of the ship's crew hastily betook themselves to the boats."—S. R.

No. 15. In No. 11 of the "Mechanics' Magazine," a drawing is given of a boat moved by wheels: and in No. 13 there is a letter signed A. B., suggesting that some machinery on a similar principle might be applied with advantage to barges navigating the River Thames. I have myself seen some drawings of an invention whereby vessels, as I am informed, may be propelled by *very easy* manual labour, at the rate of four to seven miles an hour, on such streams as the Thames. The inventor tells me that he can, in the course of a little while make the machine do its own work with only the assistance of a man to look at it occasionally. It will be asked why does he not make it public, and give it a fair trial? The answer is—the man is poor, and those who have the means of putting his invention to the test, when they have been spoken to, have laughed at it as chimerical. If A. B. has the means and feels inclined, after reading this, to assist the man, the writer of this will, on A. B. leaving his name and address at your publishers', exchange the address of the person alluded to.

In the "Hamphire Telegraph," of September, 1823, it was announced that Sir J. Cox Hippisley was making experiments at Cowes, Isle of Wight, with a large boat, which was impelled through the water, at the rate of ten miles an hour, by means of six paddle-wheels, which moved by a handwinch. Also, within the last four months, it has been noticed in the daily papers, that a boat is now in use, on the rapids in America, for conveying goods, &c., which is forced up the stream by the stream itself putting in motion paddles affixed to the sides of the boat.* This invention answers to the same purpose as what is called, in the navy, *warping*.—S. R.

No. 19. I believe Ackerman's patent axle-tree has a contrivance, by means whereof, if a carriage is run away with by the horses, it may be disengaged from them and stopped immediately, without fear of overturning.—S. R.

No. 28. No European armies are at the present day, sent on campaigns without pontoons forming part of their *materiel*. They are found very serviceable for fording small rivers;

* The same invention, we presume, which was *first* noticed and described in this country in our own pages. See pp. 67, 68. vol. I.—EDIT.

and I should suppose that they come as near to the Marquis's invention as any thing which has been used for such purposes. The pontoons are large flat-bottomed boats, which are carried by horse and cart; they are so well known to every private soldier, and to your readers, as to render any minute description needless. The English armies use tin in their manufacture—the French armies employ copper; and there is this advantage derived from the latter, that when by long use they are rendered unfit for farther service, the copper will always sell for something; but the tin, when once worn out, is of no farther use or advantage in any way whatever.—S. R.

Nos. 58, 59, 60, 61. Repeating guns have been invented in America, containing from five to twelve charges each, which may be discharged, in less than two seconds to a discharge, with the same accuracy and force as the ordinary fire-arms. The number of charges may be extended to twenty, or even forty, if required, without adding any thing to the encumbrance of the piece. The principle applies equally well to muskets, rifles, fowling-pieces, and pistols.—These guns possess all the advantage of the ordinary fire-arms, for loading and firing single charges, with the additional advantage of priming themselves, and keeping in reserve any number of charges that may be required to meet any emergency; which charges are as completely under the distinct and separate control of the gunner, as a single charge in the ordinary gun. The "Monthly Magazine" humanely wishes, in noticing this invention, that the patriots of Greece had a monopoly of them.

Now I am upon the subject of guns, I cannot help noticing that excellent improvement upon the art of shooting, in the using of percussion-guns. A Correspondent, in No. 18, p. 280, speaks very highly of a gun he used, made by one Wightman, and he gives a drawing of it. Had that gentleman seen the lock and breech invented by Mr. Beckwith, of Skinner-street, and applied by him to double and single barrelled guns, I think he would not have praised up Wightman's so much. My objection to Wightman's is, that, as described, it appears too complex, is liable to be easily put out of order, and will require a degree of skill to repair it beyond what ordinary gun-smiths possess.

One of the advantages I have found in shooting with Mr. Beckwith's gun is this, that when the powder, as will sometimes happen, however cautious you may be, clogs the chamber of the piece, and is apt to make it miss fire, let the pan or nipple be unscrewed, the entrance to the chamber cleared with a picker, and the perforation of the nipple or pan cleared also; then put in some dry powder to the chamber, and some into the perforation of the nipple, &c. and screw it in again, prime it, and it *must* go off, by reason of the accession of new powder. Should it be objected, that the gun is thus rendered liable to burst, I say, the quantity of fresh powder need not cover a half-crown; and if you are *afraid*, prop your gun in the hedge, and pull the trigger with a string. Another advantage is, that the line of fire connecting the priming of the chamber is so DIRECT and instantaneous, that the cross action of a flint-lock gives a gun upon the old principle the appearance of hanging fire.—S. R.

No. 68, as also Nos. 98 and 100, are those on which the Marquis of Worcester's claim to the invention of the steam-engine are founded. In our last, we gave an engraving of an engine, such as Professor Millington and Mr. Stuart conceive might answer the description given by the Marquis; and of this ideal sketch, we now quote the following explanatory particulars from Mr. Stuart's valuable work:—

"The two spherical vessels, *a o*, in the figure, have two pipes, *d f*, proceeding from them, and inserted into a boiler, *g*. These pipes have two stop-cocks, *z*, *w*, which shut off the communication between the boiler and the vessels. From another part of the vessels proceed two other pipes, having valves at *s x*, opening outwards, and terminating in a single pipe, *e*. The spherical vessels have each another valve opening inwards, and a very short pipe, *n v*; the pipe

a e, rises forty feet, and terminates in the reservoir, *u*; *b* is a section of the fire-grate, under the boiler, *e*; *t*, the door of the fire-place; *l*, the brickwork; *g*, the ash-pit; and *h* is a reservoir of water in which the vessels, *o a*, are placed, and which is to be returned into the cistern, *u*. If we now suppose a sufficient quantity of steam to be generated in the boiler, *c*, from the water, *g*, and the stop-cock, *z*, opened so as to allow a free communication between the boiler and the vessels in the reservoir, the steam will descend into the pipe, *d* (the pipes and vessels being made or cased with some material to prevent the condensation of the steam by the water in the reservoir into the vessel *a*,) and will expel all the water or air which it may contain through the valve, *s*, into the pipe, *e*, which will deliver it into the reservoir, *u*. The cock, *z*, is now to be shut, and the valve, *v*, being freed from the pressure of the elastic vapour, will be forced inwards by the gravity of the water in the reservoir, which will speedily fill the vessel, *a*. But when the cock, *z*, is shut, the opposite one, *w*, is opened, and the steam from the boiler raises the water which may be contained in *o* up the pipe, *e*, closing, in this operation, the valve, *s*. When the vessel, *o*, is filled with steam, the cock, *w*, is shut, and the water in the reservoir rushes into *o*, as it did into *a*, and fills it. The cock, *z*, is now opened, and the steam again expels the water from the vessel, *a*, and so on successively, so long as steam is produced in the boiler, and the cocks, *z a*, are opened and shut alternately.

"Mr. Millington remarks that this engine agrees, so far, with the Marquis of Worcester's description, where he says that 'a man has but to turn two cocks, and that one vessel of water being consumed, another begins to force and refill.' He also observes that the condensation of steam opens and shuts the valves, and fills the vessels; but that this use of the vacuum is part of an invention to which the Marquis has no claim, his Lordship expressly stating, 'that the water *is not* raised by drawing or sucking it upwards.' The 'force and refill,' in the original account, would almost lead to a supposition that those operations were going on at the same moment in the same vessel. The arrangement of pipes, and cocks, and valves, is also gratuitous.

"The 'admirable method of drawing up water by fire,' appears to have been the favourite project of the noble inventor; for he afterwards devoted a separate book to an enumeration of its extraordinary uses and powers, under the title of an 'Exact and True Definition of the most stupendous Water-commanding Engine, invented by the Right Honourable (and deservedly to be praised and admired) Edward Somerset, Lord Marquis of Worcester, and by his Lordship himself presented to his most Excellent Majesty Charles the Second, our most gracious Sovereign.' This 'Exact and True Definition' is a quarto pamphlet of twenty-two pages; but, instead of *a definition*, it contains only an enumeration of the *marvellous uses* of his invention, as vaguely and strangely written as those in the 'Century of Inventions.' The rest of the pamphlet is filled up with an Act of Parliament, allowing him the monopoly of such an engine, and reserving the tenth part of the profits to the king, with four wretched verses of *his own*, in commendation of his invention; with the '*Exegi monumentum*,' of Horace, and the '*Barbara Pyramidum sileat*' of Martial. Some Latin and English verses, panegyrizing the noble inventor, written by James Rollock, an old dependant of his Lordship, complete the volume."

Mr. Stewart afterwards gives another design of an engine, which, in his opinion, approaches still nearer to the description of the Marquis than that which we have just been considering.

"From the opinion we have expressed," says Mr. Stuart, "of its being practically impossible to produce an apparatus fulfilling *all* the conditions of the description in the 'Century of Inventions,' without introducing parts which are unquestionably due to the inventive genius of other mechanics, it is with great diffidence we propose the apparatus represented in the second figure, as being nearer to the description than that shown in the first figure, in so far as *not using the pressure of the atmosphere*, which the Marquis states *a principle of his engine*.

"But, after all, it is impossible to decide from Lord Worcester's description whether *two boilers* are meant, and one *receiving vessel*, or *two vessels* and *one boiler*, or only two vessels, like Da Caus's, probably having each an eduction pipe and the proper cocks to produce a continuity in the stream of water, as in the figure prefixed to the present Illustrations, where the dotted lines rising from the vessel *a* would then represent this pipe, the fire being made under each boiler alternately. And where mention is made of one vessel of water, rarefied by fire, driving up forty of cold water, should not this be understood as the proportion of water which would be converted into steam, in order to raise the remaining portion in the *same vessel* forty feet high? An apparatus designed on this supposition would satisfy the description nearer than any.

"Having so wide a choice, we will give the Marquis credit for an apparatus for generating the steam in a separate boiler: *a* will, therefore, be that boiler; *c*, a pipe (having a stop-cock, *d*) connecting the boiler with the cold-vessel water, *e*, from which proceeds the eduction pipe, *f*; *g*, a pipe and funnel, to supply the boiler with water; *h*, a similar pipe-cock, to supply the vessel, *e*, with cold water, connected with a cistern from which the water is to be raised; *i* is a stop-cock to this pipe; *k*, a valve to prevent the return of the water which may be in the upper part of the pipe, *f*.

"When the steam in the boiler, *a*, is allowed to enter the cold-water vessel, *e*, by turning the cock, *d*, the water is raised in a

jet through *f*, until the vessel, *e*, is emptied. When this is the case, the cock, *d*, is shut, and *i* is opened, and the vessel, *e*, is again filled with cold water. The cock, *i*, is then shut, and the stop-cock, *d*, is opened; and the steam from the boiler, pressing on the surface of the water in *e*, forces it up the pipe, *f*. When this is emptied, the same operation is repeated, and so on successively; so that the condition of the alternate opening and shutting *two cocks* is fulfilled, also the forcing and refilling of the vessels; and one vessel of water rarefied by fire would elevate double the quantity of that stated by the Marquis."

(To be continued.)

REPORT OF A COMMITTEE OF THE AMERICAN CONGRESS ON HIGH PRESSURE STEAM ENGINES.

(Continued from page 27.)

Farther, to corroborate the opinion of your Committee on the superior safety of low pressure engines, they subjoin part of a Report made by a Committee of the City Council of Philadelphia, raised to inquire what regulations were necessary to produce the safety of passengers in steam-boats. That Committee consulted scientific men of eminence: Professor Cooper, Mr. Graff, and Mr. Jacob Perkins; and obtained from them the following detailed opinions:

To Thomas Cooper, Joseph Cloud, Jacob Perkins, and Frederic Graff, Esqrs.

I am directed, by the Joint Committee of the Select and Common Councils of the City of Philadelphia, appointed on the subject of Steam Boats, to submit the following questions for your consideration, and request the favour of answers as early as they can be furnished consistently with your convenience.

Very respectfully,

ROBERTS VAUX, Chairman, &c. &c.

Philadelphia, 7th mo. (July) 3, 1817.

1st. Whether what is commonly called a high pressure engine is, in your opinion, proper for a passage boat? whether, with the precaution of proving the boiler once a month, and a double safety valve, as proposed by you, will render them perfectly safe? whether in case of an explosion, when the steam is at the ordinary pressure at which such engines are worked, it would not, probably, be fatal to the lives of most of the persons on board?

2nd. Whether an engine that works with a pressure of from seven to ten pounds to the square inch, would, in case of explosion, probably do any injury, except to persons who were immediately adjacent to the boiler, or who were not separated from it by a partition? and whether the common partition in use in boats navigated by low pressure, and the distance at which passengers on deck or in the cabin are from it, does not make them safe?

3rd. Whether, to your knowledge, boilers on the low pressure plan have not frequently burst, without any injury whatever to the passengers: and if any case to the contrary exists, what are the particulars of it? What experience have you on the subject of explosions of high pressure engines, and the consequences?

To Roberts Vaux, Esq. Chairman of a Joint Committee of the Select and Common Councils of the City of Philadelphia.

SIR,—In reply to the farther questions proposed by the Committee, the undersigned states, as his opinion,

1st. That, whatever be the construction of a steam engine on board a boat, the precautions already recommended in a former report to the Committee, are *indispensable* to the perfect safety of the passengers.

2nd. Although with due precautions and continual care, the danger arising from engines working with high pressure, may be reduced, so as to render them as little liable to explosion as the engines that work with a low pressure, yet accidents must be calculated upon to happen to engines of all and every construction at one time or other. *In such cases the danger will be far greater from engines worked with steam of high pressure, than with the common engines of Bolton and Watt, or Fulton.* Even in cases where the danger arrising from an accident is trifling, the noise and the vapour that issue from a very small opening in the boiler or other parts of a high pressure engine, are so much more alarming to persons ignorant of the cause, than when a similar accident happens in an engine of low pressure, that the chance of this happening well deserves to be taken into the account: for the fright and the alarm may have serious consequences, even when there is no other real danger.

3rd. Every engine working with steam beyond ten pounds upon the square inch, ought to be considered as a high pressure engine.

4th. Under present circumstances, it seems expedient to give a decided preference to engines in steam boats where the pressure is below ten pounds on the square inch, for even that pressure is unnecessary, and may and ought to be avoided.

5th. With respect to the explosions and accidents that have happened on board steam boats, in this country and in England, the statements have been too loose and general to afford any foundation for an accurate and decided opinion; but enough has been published to show that these accidents have happened from rashness or negligence, by means of which the steam valve has been overloaded, or by using machinery ill made or too much worn. A steam engine on the construction of Bolton and Watt may rashly or negligently be loaded with fifty pounds instead of five pounds; but it is manifest that steam pressed with twenty pounds, for instance, cannot possibly do so much damage as steam pressed with two hundred pounds on the square inch. In the latter

case it would act act nearly with the force of gunpowder, as there is good reason to believe it has often done.

6th. As, in all civilized countries, passengers are under the protection of the law, and ferries and carriers, whether by land or water, are objects of legislative control, this subject seems to the undersigned proper to be submitted to the consideration of the legislature.

THOMAS COOPER.

July 7th, 1817.

SIR,—In answer to your inquiries respecting high pressure engines, and those on the Bolton and Watt principle, with steam from seven to ten pounds, on board of passage-boats, I submit my opinion, without any other motive than that for the safety of the lives of those who travel by that convenient mode.

1st. As respects high pressure engines, I am of opinion, that if the precautions recommended in a former Report are rigidly enforced, perhaps explosions would not take place; but presuming that, with all the care of those appointed to make a monthly survey, some part of the work might be overlooked, from hurrying the examination, in order to have the boat ready for the succeeding trip; this induces me to believe, that it is probable fatal accidents may occur, and many lives be lost, if an explosion should take place.

2nd. An engine that is worked with the pressure of from seven to ten pounds to the square inch, with a boiler reasonably strong, there can be little danger of an explosion; but should an explosion take place, I am persuaded that the danger to passengers in the cabin or on deck would be trifling, provided the partitions and deck between the boiler and the cabin are sufficiently strengthened, *and the doors, if admitted at all*, are hung in such a way, that by the concussion occasioned by the explosion, they would fly shut. I would recommend an additional passage from the cabin to the deck in the after part of each boat, that. in case of accidents, a more ready passage would be at hand, without being obliged to pass out near the boiler, as is now the case in most of the steam-boats on the Delaware.

3rd. The only burst which has come to my knowledge in working low pressure steam, happened with one of the boilers at the lower engine of the Philadelphia waterworks, occasioned by the heads of the bolts burning off over the fire-place, and the joints parting; the workmen received no injury, as the fire-doors were shut—the boiling water passed into the ash-pit.

From the information I have obtained, it appears that every accident that has occurred was occasioned by high pressure steam, applied either in engines adapted for working high steam, or those of Bolton and Watt, which were never intended by the inventors to carry more than six pounds in the extreme. As the Bolton and Watt engines are now worked with from ten to twenty pounds pressure, I conceive the danger of explosion nearly as great as with those working at a pressure of 150 pounds to the square inch, and in some instances greater, where the construction of the boiler is not adapted to carry more than from seven to ten pounds with safety.

I am with great respect, your obedient humble servant,

FRED. GRAFF.

Philadelphia, July 9, 1817.

Roberts Vaux, Esq. Chairman, &c.

Philadelphia, July 8, 1817.

SIR,—In reply to the farther questions proposed by the Committee, the undersigned is of opinion,

1st. That all engines worked with a pressure above from five to seven pounds the square inch are unsafe, unless the precautions already recommended in a former Report to a Committee are adopted. That the engines which work with a pressure of seven pounds and below need only a second safety valve, without the proof; for, should an explosion take place, experience shows that the passengers would be perfectly safe.—There is no doubt, that in case of an explosion, the higher the steam, the greater the danger; but engines may be so constructed, that there would be no danger, even with a pressure of 150 pounds to the inch. Boilers may be made to withstand the pressure of 600 pound to the inch. and, if proved often enough to detect any defect occasioned by corrosion or otherwise, it would seem that no explosion could possibly take place.

2nd. If boilers were made so weak as to be *sure* of bursting at a pressure of seven pounds or below, there would be little or no danger from such explosions; but boilers have many modifications; some will burst at the low pressure of four pounds, when others will not burst at 300 pounds. The boilers that are constructed to bear the pressure of 20 to 50 or 60 pounds, the undersigned is of opinion, are the most dangerous, since it is more easy to get the steam up to that height, than to raise it from 150 to 300 pounds.

3rd. As far as the knowledge of the undersigned extends, all explosions that have taken place, where the engines have been worked at seven pounds and below, have done no injury to the passengers. It is the boilers that have been made to bear a higher pressure than seven pounds to the inch which have proved so fatal; but had the owners known their strength, and been provided with safety valves, properly adjusted, no explosion could have taken place; unless they had been constructed like the two on the Mississippi which have produced such disastrous consequences. This form of boilers should certainly be abandoned; no safety valve, nor any precaution, would make them secure. These boilers are cylindrical, and have flues passing through their centre.

The misfortune has not happened by the bursting of the boilers, but has been occasioned by the flue, where the fire is built, being heated to such a degree, when the water has been suffered to get too low, as to collapse, and make an opening for the steam and water to rush out. This was the case with the Washington and the Constitution. At the Pittsburgh nail factory, where Evans's most improved boilers had been used for a number of years,* it was apprehended it was time to replace them; and while new boilers were making, one exploded while the steam was at sixty pounds. When examined, it was found that a piece was blown out at the top, about four by six inches. It removed a few bricks, but occasioned no mischief. It was found that the thickness of the iron was reduced, by corrosion, to less than one-sixteenth* of an inch, at the spot where the explosion took place. The undersigned has not been informed particularly as to the other disastrous explosions; but he believes several have taken place as low as twelve or fifteen pounds pressure, and that such ought to be considered as high pressure engines.

Yours, respectfully,

JACOB PERKINS.

Roberts Vaux, Esq. Chairman, &c.

The opinions of such men carry with them great weight; and it is believed, that the precautions recommended by them are the same as those proposed by your Committee. The committee, therefore, report a Bill.

* This rappid corrosion was accasioned by the use of mineral water; since river water has been used, no accident has taken place.

* When new, it was five-sixteenths.

METHOD OF RAISING FALLEN CARRIAGES.

Fig. 1.

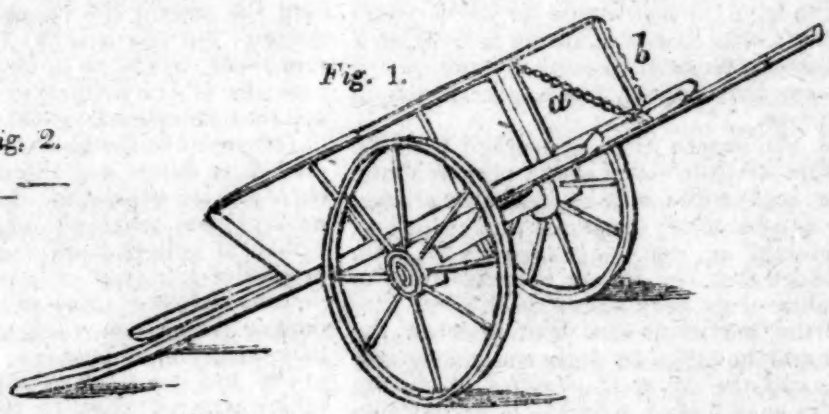
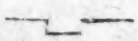


Fig. 2.



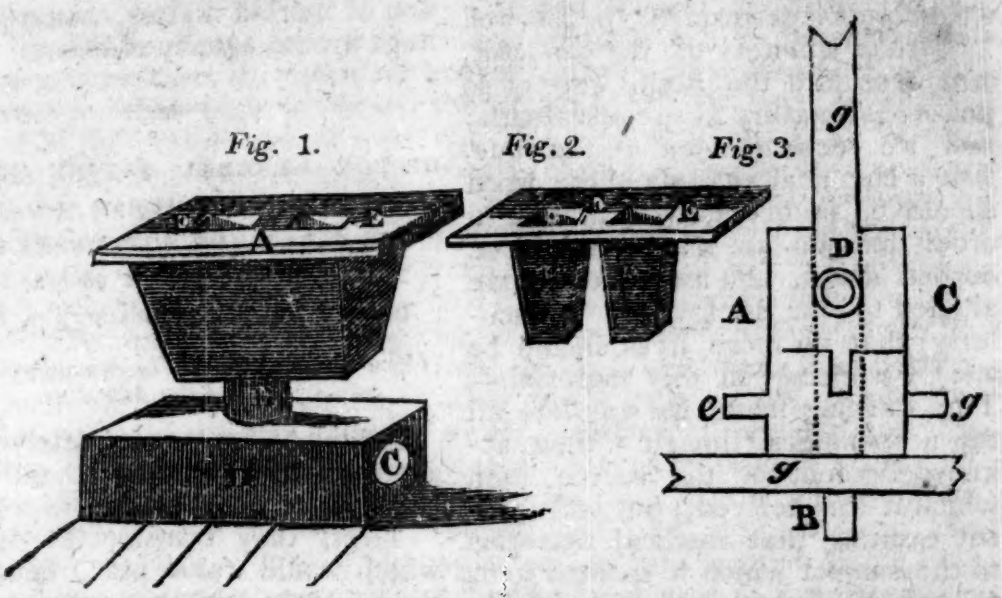
SIR,—A premium has been held out by the Society of Arts for several years past, for preventing the falling of horses with two-wheeled carriages. Now, as it is not in my power (nor, I believe, in the power of any one,) to prevent their falling, I propose the following method of raising them when fallen:—

Suppose the body of the cart to be six feet long, and that there is space enough (as there generally is) between it and the axletree to admit a piece of wood of the same length (six feet,) and about four inches thick, made to slide through a strong staple (Fig. 2.,) bolted underneath the tail of the cart. Now, as the cart itself is a lever, the fulcrum of which is the axletree, it is easy to conceive that, when the additional lever is drawn out, and the weight of four or five men applied to it, the power gained will instantly release the poor, suffering animal from its painful situation. I should think that half a minute would be quite sufficient time for the whole operation.

Your Subscriber, E. W.

P.S. The two chains, *a* and *b*, may be fastened to the sides of the cart, and hooked on to the lever for additional strength.

WOOL-COMBING STEAM CHEST—PLAN FOR A PUMP WANTED.



Sir,—In No. 46, you have given an account of a Steam Soldering Machine, which induces me to send you a short description of a Wool Combing Steam Chest, for heating the combs by steam instead of charcoal. The invention has now been about nine years in use. I know of one room in which there are about twenty-six of those steam chests at work, supplied from one steam boiler. The "Goldsmith's Apprentice" states, that tin is not strong enough, and that copper or brass must be employed On this point it may be proper to state what the experience of the inventor of the combing chest has been. He first had a box made of tin, and fixed to the steam that supplies the works; but the steam melted the solder that the chest was put together with He then tried copper and hard solder, but they met with the same fate Foiled in these two experiments, he got a cast iron chest made, when he found it to answer completely.

Description of the Engravings.

Fig. 1 is the steam-chest; Fig. 2 exhibits a clearer view of the inside, which is cast in separate parts, and put together with screws and cement, as shown at the part A in Fig. 1. B is the pipe that connects the chest with the main steam pipe; C is the main steam pipe; D, the wooden casing that covers the main steam pipe that runs along the room floor, and keeps down the heat from the men at work; E E are the places where the combs are heated; F shows that the top projects a good way over, to give more room for the wool to lie on when the men are working it.—This plan is found to answer well for fine wool.

I remain, Sir.

The North Star.

Sir,—I shall be obliged to any of your readers who will assist me with a plan for a Pump, which I wish to serve three different apartments. It must be fixed in a party-wall. I shall have no objection to two levers to the spear-rod, and it should be so contrived that A B and C (Fig. 3, in this page) may be able to work without going into each other's apartments; and that the water will only run out at the spout going into the apartment of that person who pumps. Suppose A B and C to be three different apartments; D, the pump; *g*, the walls; E F and G the three spouts to supply the rooms A B and C with water. The query is, How to make it only run out at the spout of the person who pumps? I presume the working of the pump is easy, but turning the water three ways is the great point.

Lancaster. M. S.

POISONOUS NATURE OF AFRICAN TIMBER.

We were the first to state, several weeks ago, on the authority of a respectable Correspondent (p. 236, vol. II.,) that splinters of African oak, when run into the flesh, were of so poisonous a nature as to cause death; and we recommended at the time, that a chemical analysis of the wood should be immediately instituted, in order that the fact might be placed beyond doubt, and care taken (we alluded to our dock-yards particularly) that no more lives should be lost by working on this material.—The warning found its way into all the newspapers (though without acknowledgment of the source from which it was derived,) but still without exciting that medical attention to the subject which it seemed to us so imperiously to call for. Of the consequences of this neglect, the following paragraph in "Flindell's Western Luminary" furnishes a melancholy illustration. We trust that an inquiry into the subject, by the competent authorities, will no longer be deferred.

"In the course of the last fortnight, seven shipwrights and two sawyers, of Plymouth-yard, have died. All these men had received cuts or bruises, while employed on African teak-wood; and though some have attributed the deaths to atmospherical influence, there are not a few who assign them to the reception of poisonous juices of the above-named timber. Of these men, a shipwright, Gregory Nichols, a remarkably powerful and active man, scratched his leg against a piece of the wood, and mortification ensued almost immediately. To ascertain the probable cause, Dr. Bell, surgeon, opened the body, and in the course of dissection, happened to scratch one of his fingers. This passed unnoticed at the time; but, in the afternoon, Dr. Bell became alarmed at perceiving it, thinking he might have imbibed some of the morbid matter; shortly afterwards a shivering came on, and he was obliged to be put to bed and bled. The best medical aid was administered, and the most rigid attention paid to his case; but, in spite of all, the symptoms daily became worse, and on Friday evening he died. Since writing the above, it is said that Rawlins, a shipwright, living at New Passage, and who had slightly scratched himself, is dead; and that another, residing at Torpoint, is at the point of death, from a similar cause."

It may be proper to observe, however, that Dr. Bell's death seems to be improperly ascribed to the poisonous quality of the timber. He perished, as many of his profession have done, merely from the infection of morbid matter, assisted perhaps by the agency of fear.

OF THE GENERAL NATURE AND ADVANTAGES OF WHEELS AND SPRINGS FOR CARRIAGES, THE DRAFT OF CATTLE, AND THE FORM OF ROADS.—BY DAVIES GILBERT, ESQ. F. R. S. &c.

(From the last Quarterly Journal of Science and the Arts.)

Taking Wheels completely in the abstract, they must be considered as answering two different purposes.

First, they transfer the fraction which would take place between a sliding body and the comparatively rough and uneven surface over which it slides, to the smoth oiled peripheries of the axis and box, where the absolute quantity of the friction, as opposing resistance, is also diminished by leverage, in the proportion of the wheel to that of the axis.

Secondly, they procure mechanical advantages for overcoming obstacles in proportion to the square roots of their diameters, when the obstacles are relatively small, by increasing the time in that ratio during which the wheel ascends; and they pass over small transverse ruts, hollows, or pits, with an absolute advantage of not sinking, proportionate to their diameters, and with a mechanical one, as before, proportionate to the square roots of their diameters.—Consequently, wheels, thus considered, cannot be too large: in practice, however, they are limited by weight, by expense, and by convenience.

With reference to the preservation of roads, wheels should be made wide, and so constructed as to allow of the whole breadth bearing at once; and every portion in contact with the ground should roll on it without the least dragging or slide. But it is evident, from the well-known properties of the cycloid, that the above conditions cannot unite, unless the roads are perfectly hard, smooth, and flat; and unless the fellies of the wheels,

with their tires, are accurate portions of a cylinder. These forms therefore, of roads and of wheels, are the models towards which they should always approximate.

Roads were heretofore made with a transverse curvature, to throw off water; and in that case it seems evident, that the peripheries of the wheel should, in their transverse sections, become tangents to this curve, from whence arose the necessity for dishing wheels, and for bending the axes; which contrivances gave some incidental advantages for turning, for protecting the nave, and by affording room for increased stowage above. But recent experience having proved that the curved form of roads is wholly inadequate for obtaining the end proposed, since the smallest rut intercepts the lateral flow of the water; and that the barrel strap confines carriages to the middle of the way, and thereby occasions these very ruts; roads are now laid flat, carriages drive indifferently over every part, the wear is uniform, and not even the appearance of a longitudinal furrow is to be seen. It may, therefore, confidently be hoped, that wheels approaching to the cylindrical form will soon find their way into general use.

The line of traction is mechanically best disposed when it lies exactly parallel to the direction of motion, and its power is diminished at any inclination of that line, in the proportions of the cosine of the angle to radius. When obstacles frequently occur, it had better, perhaps, receive a small inclination upwards, for the purpose of acting with most advantake when those are to be overcome. But it is probable that different animals exert their strength most advantageously in different directions; and, therefore, practice alone can determine what precise inclination of this line is best adapted to horses, and what to oxen. These considerations are, however, only applicable to cattle drawing immediately at the carriage; and the convenience of this draft, as connected with the insertion of the line of traction, which, continued, ought to pass through the axis of the wheels, introduces another limit to their size.

Springs were, in all likelihood, applied at first to carriages with no other view than to accommodate travellers: they have since been found to answer several important ends. They convert all percussion into mere increase of pressure; that is, the collision of two hard bodies is changed, by the interposition of one that is elastic, into a mere accession of weight. Thus the carriage is preserved from injury, and the materials of the road are not broken; and, in surmounting obstacles, instead of the whole carriage, with its load, being lifted over, the springs allow the wheels to rise, while the weights suspended upon them are scarcely moved from their horizontal level. So that, if the whole of the weight could be supported on the springs, and all the other parts supposed to be devoid of inertia, while the springs themselves were very long, and extremely flexible, this consequence would clearly follow, however much it may wear the appearance of a paradox: that such a carriage may be drawn over a road abounding in small obstacles without agitation, and without any material addition being made to the moving power or draft. It seems, therefore, probable that, under certain modifications of form and material, springs may be applied with advantage to the very heaviest waggons; and, consequently, if any fiscal regulations exist either in regard to the public revenue, or to local taxation, tending to discourage the use of springs, they should forthwith be removed.

Although the smoothness of roads, and the application of springs, are beneficial to all carriages, and to all rates of travelling, yet they are eminently so in cases of swift conveyance; since obstacles, when springs are not interposed, require an additional force to surmount them, beyond the regular draft, equal to the weight of the load multiplied by the sine of the angle intercepted, on the periphery of the wheel, between the points in contact with the ground and with the obstacle, and therefore proportionate to the square of its height; and a still farther force, many times greater than the former,

when the velocity is considerable, to overcome the inertia, and this increased with the height of the obstacle, and with the rapidity of the motion, both squared. But when springs ure used, this latter part, by far the most important, almost entirely disappears, and their beneficial effects, in obviating the injuries of percussion, are proportionate also to the velocities squared.

The advantages consequent to the draft, from suspending heavy luggage on the springs, were first generally perceived about forty years since, on the introduction of mail coaches; then baskets and boots were removed, and their contents were heaped on the top of the carriage. The accidental circumstance, however, of the height being thus placed at a considerable elevation, gave occasion to a prejudice, the cause of innumerable accidents, and which has not, up to the present time, entirely lost its influence; yet a moment's consideration must be snfficieut to convince any one, that when the body of a carriage is attached to certain given points, no other effect can possibly be produced by raising or by depressing the weights within it, than to create a greater or a less tendency to overturn.

The extensive use of wagons suspended on springs, for conveying heavy articles, introduced within these two or three last years, will form an epoch in the history of internal land communication, not much inferior, perhaps, in importance to that when mail coaches were first adopted; and the extension of Vans, in so short a time, to places the most remote from the metropolis, induces a hope and expectation, that as roads improve, the means of preserving them will improve also, possibly in an equal degree; so that permanence, and consequent cheapness, in addition to facility of conveyance, will be the distinguishing features of the M'Adam system.

A PROPOSITION.

Sir,—Allow me to circulate the following proposition through the means of your widely circulated publication. I pledge myself to navigate barges, or other vessels of burden, pleasure, or for passengers, on *canals* (or any other water,) by a combination of powerful and simple machinery, which has *never yet* been put on board any vessel. The agitation of the water shall not be so much as to affect the banks of the canals: the weight of the machinery shall not exceed 300lbs.: the speed of the vessels may be regulated as desired. I will fit up a vessel upon this plan *gratis*, for any gentleman or company, as I do not make the proposition from mercenary views. I need not tell you, Sir, who must be experienced in the ways of the world, *why* I do not describe the machinery in the first instance, nor *why* I adopt in lieu of my own name, the signature of PHILOPAT.

(Any communications to "Philopat" will be duly forwarded.—Ed.)

REMARKS ON "THE IDEA OF AN AIR ENGINE."

Sir,—Your Correspondent W.H.C. will find, on referring to p. 381, vol. ii. under the head of "The Case in Machinery," a few remarks, in some degree applicable to the subject he has started in No. 57, vol. iii. In that paper I have stated, that no profit of power can possibly be obtained by the compression or exhaustion either of an elastic or non-elastic fluid; nor can there, whatever may be the method of its application; and, therefore, I shall only make an observation or two on the particular idea of explosion.

Explosion denotes a sudden impetuous action, capable of generating great velocity, produced either by chemical change, or by letting loose an elastic fluid of great density. In letting loose an elastic fluid against any body of nearly equal resistance to the force of its power, a slow motion only will be produced, similar in effect to the action of steam against a piston, and which does not amount to the idea of explosion; but when such a violent action does take place, and great velocity is generated, the resistance of the body put in mo-

tion bears a very small proportion to the power by which it is expelled. In either case, however, whether we multiply the body of the greatest resistance by its velocity, or that of the smallest by it, we shall not find their effective forces exactly to compensate for the power absorbed in compressing the elastic fluid.

Fieldgate-street, Oct. 4. G.

Errata.—In page 381, for "1000 parts," *read* "a 1000 part; and again, for "equal 1000 parts of the pressure of the atmosphere," &c. *read*, "equal to a 1000 part of the pressure," &c.

A NONSUCH PARTY.

A friend, who lately visited Paris, at one of Mr. Arago's *soirées* met with the following distinguished persons, all of them remarkable for having performed journeys or adventures, of which there was no parallel:—1. There was Professor Simonoff, who was astronomer to the Russian expedition into the Antarctic Circle, and who had been nearest to the *South Pole* of any man living. 2. Captain Scoresby, *Junior*, who had been nearest to the *North Pole* of any one living. 3. Baron Humboldt, who had been higher on mountains than any other philosopher. 4. Madame Freycinet, the only lady who had ever accompanied a voyage of discovery, and circumnavigated the globe. 5. M. Gay-Lussac, who had, we belive, been the highest in the air of any man. 6. M. Callien, who had travelled, with the son of the Pacha of Egypt, farther towards the sources of the Nile than any person now living.

VALUE OF THE COTTON MANUFACTURES.

The value of the Cotton Manufactures exported during the twenty-two years of the late war, from 1793 to 1815, amounted to 208 millions sterling, at the official value. The raw material, at four millions per annum, amounts to 88 millions sterling. The net annual receipt from foreign countries, for profit and wages, was therefore 120 millions, or about five millions and a half per annum. But the whole value of all the British manufactures exported during that period was 548 millions; which, after deducting for the raw materal 148 millions, will leave 400 millions added to the taxable capital of the nation, at the rate of more than 18 millions per annum, by amount received for the wages and profit of British productive labour. In the eight years since the return of peace, from 1815 to 1822, the cotton manufactures exported are upwards af 177½ millions, at their official value; and deducting five millions per annum for the raw material, leaves 137½ millions, being about 17¼ millions per annum which being added to the export of the twenty-two years preceding, and make upwards of 257½ millions contributed since the commencement of the late war, by cotton-manufuctures alone, to the taxable capital of the nation. But in the last eight years, the whole amount of exported British manufactures is 332 millions; and deducting the raw materials, at the increased rate of 7½ millions per annum, will leave 272 millions, being about 34 millions per annum; which being added to the produce and profit of the wages for the twenty-two years of the war, as before mentioned (400 millions,) will make 672 millions received in the last thirty-years, since 1793, being upwards of 22½ millions per annum, for wages and profit produced by British industry, and received from other nations. During the war, the sum added to the national debt by loans was 569 millions; which, it thus appears, was exceeded upwards of 100 millions, by the amount received from foreign countries for the ingenuity of the English artisan, and the industry of the English labourer.

ROMAN POLISH.

SIR,—Having frequently visited the Vatican during my stay at Rome, in the winter of 1818, I was much struck with the brilliant polish of

mahogany (if I remember right) bookcases; and as the then Pope Pius the Seventh was adding to the library, and putting up additional bookcases, that were made equally brilliant, upon the spot, I not only watched the progress, but asked one of the workmen how it was done. As I have read much about French Polish in your interesting Magazine, perhaps you would not object to a receipt for a Roman Polish, which has the advantage of requiring no varnish, and is very much at your service.

Brick dust, sifted very fine; olive oil mixed with it, just to give it the dampness of flour; this is rubbed by a pumice stone upon the wood till perfectly smooth; then add spirits of wine, and continue rubbing it till you have the required polish, which is beautiful, and more durable than any other.—Yours,

POLVORE DI MATTORE.

I shall be very glad to hear that the above answers; and if any of your readers that has given it a fair trial upon a small scale will mention his success, it will be a general benefit.

REVOLUTION OF COG-WHEELS.

SIR,—In Vol. II. No. 56, of your useful publication, a problem is given, requiring the revolutions of certain cog-wheels, which I will endeavour to solve; but, as it will be better understood by adverting to the problem of R. G., in Vol. I. No. 16, which, as he requires a *simple* rule, I conceive he has not been fully answered, I will first reply to that. As a general rule, if the greater number of cogs will divide by the lesser, and leave no remainder (for instance, 12 and 72,) the quotient is the number of revolutions made by the smaller for one turn of the larger; and if the larger number cannot be divided by the lesser, and they are both divisible by the same divisor (as 27 and 36,) then divide them by the highest; the revolutions of the large wheel will in that case be the quotient of the less, and *vice versa*; but if the larger will not divide by the lesser, nor both by the same number (as 43 and 127,) the large wheel revolves as often as the smaller has cogs, and *vice versa*.

In J. H.'s problem (p. 445,) C has 28 cogs, D 66; according to the above rule, 28÷2=14, 66÷2=33; therefore C revolves 33 times, and D 14 E has 60, F 28, 60÷4=15, 28÷4=7, E revoles 7 times, F 15. G and H having the same number of cogs, might, as far as the problem is concerned, have been left out altogether, as they only serve to change the horizontal to a perpendicular motion. I has 47 cogs, K 11; therefore I turns 11 times, while K revolves 47. E being fixed on the same axle as D, must have 14 revolutions also, which will cause F to have 30, G 30, H 30, I 30, and K 128 revolutions and 2 cogs, as is shown thus: 47 (the number of cogs in I) ×39= 1410÷11 (the number of cogs in K) =128 2. But in order that K may make perfect revolutions, the revolutions of each wheel must be multiplied by 11, the number of times I ought to revolve: 33 × 11 = 363, 14×11=154, 30×11=330 128 2×11 =1410. Therefore, exclusive of A and B, the number of turns are thus: C 363, D and E 154, F G H and I 330, K 1410. As, however, A and C are on the same axle, they must, of course, revolve the same number of times; therefore the above numbers must be multiplied by 127, and A 127, and B 43 by 363: 363×127= 46101, 43×363=15609, 154×127= 19558, 330×127=41910, 1410×127 =179070. Which process makes the answer to the problem thus:— B 15609, A and C 46101, D and E 19558, FGH and I 41910, K 179070, when they will, for the first time, have all resumed the places from whence they set out.

Yours, &c. F* S*

SIR,—In your 56th Number, page 445, there is a question proposed by your Correspondent J. H. respecting the Revolution of Cog-wheels. By inserting the following solution in your valuable miscellany, you will oblige, yours, &c.

Harpurley. JOSEPH HALL.

All wheels on the same shaft or axis make one or any number of revolutions in the same time: $127 \times 28 \div 66 = 33\frac{28}{33} \times 35 = 1778$, also $127 \times 33 = 4191$, and $43 \times 33 = 1419$. Again, 60 working into 28 is the same as 15 working into 7, then $1778 \times 15 \div 7 = 3810 \times 47 = 179070$; therefore the number of revolutions, by each wheel respectively, will be as follows:

A - - 4191×11=46101
B - - 1419×11=15609
C - - 4191×11=46101
D - - 1778×11=19558
E - - 1778×11=19558
F - - 3810×11=41910
G - - 3810×11=41910
H - - 3810×11=41910
I - - 3810×11=41910
K - - - - - - - 179070

TAPPING NUTS.

ERRATUM.—In the description of the method of Tapping Nuts, (No. 56, p. 445,) for "one quarter inch nut," say, "*one inch and quarter*;" and in the second line after that, say, "*one inch and one eighth.*"

T. G. D.

SIR,—In perusing your valuable Magazine (No. 56, p. 445,) I find a letter signed T. G. D. mentioning a simple method of Tapping Nuts with a smaller Tap. For my own part, I have practised the same these fifteen years, and have seen others do the same; so that I can assure T. G. D. (whoever that gentleman may be) that he is not the inventor, as he so politely wishes to appear.*

Your's, &c. J. W. M.

Gravel Lane, Southwark,
Oct. 3, 1824.

* This is not quite fair towards T. G. D.; since he stated, expressly, that he did *not* know whether the plan had originated with him or not, and communicated it to us merely because he believed it to be not *generally* known:—which, notwithstanding what our present Correspondent states, *is the fact*.—ED.

NEW PATENT.

To Alexander Nesbitt, broker, of Upper Thames-street, London, who, in consequence of a communication made to him by William Van Houten the Younger, a foreigner residing abroad, is in possession of a process by which certain materials may be manufactured into paper or felt, or a substance nearly resembling coarse paper or felt, which material so prepared is applicable to various useful purposes,—27th July.—Six months.

INQUIRIES.

NO. 67.—OIL-CLOTH PAINTING.

SIR,—Will any of your Correspondents have the goodness to say, what is in general used in the painted cloth manufactories to soften the rigidity of the linseed-oil, or, in other words, to render the cloths, when painted, pliable? C.

NO. 68.—BRICK-MAKING.

SIR,—I shall feel obliged, by any of your intelligent Correspondents bestowing their thoughts to the construction of a Machine for making Bricks. The principal objects required are, first, to supply the mould with earth; secondly, to press the earth into the mould, in such a manner as will expel as much of the water as possible; thirdly, that the machine shall strike off the superfluous earth from the mould, in such a manner as not to cling to the instrument; fourthly, that the machine shall not make less than ten bricks per minute.

A SUBSCRIBER.

NO. 69.—RE-FROSTING SILVER.

SIR,—I should feel greatly indebted to any of your readers, who could furnish a method of Re-frosting Silver that has become tarnished. It would be desirable if it could be done without fire, and I have heard that it can be effected.—Yours,

C. C. C. C.

ANSWERS TO INQUIRIES.

NO: 58.—PLANS FOR A COTTAGE.

SIR.—I return you herewith all the plans of Cottages, &c. I shall adopt the plan exhibited by "Z Z." which I highly approve for its neatness, convenience, and also as being the most suitable to the situation for which it is designed, and calculated to be executed at as little expense as any one I have received.

There are many of the others sent that are certainly very handsome designs, and displayed in a masterly style; but most of them are upon a scale, as regards the costs of the erection, far exceeding the present object.

I shall make one alteration in "Z. Z.'s" elevation, which is, to carry the building up square, and give it an overhanging roof of slate, instead of a parapet front. You will please to name this to him, in order that he may, if he pleases, make the alteration in the drawing, for insertion in your excellent and useful work, the "Mechanics' Magazine."

I send you herewith two guineas, to be paid to the author of the plan marked "Z. Z." and countermarked "X.X."—I am, Sir, &c. X. X.

["Z. Z." will receive the premium on application at 55, Paternoster-row, as also the approved Plan, which we shall be glad to receive back from him for insertion, with the alteration suggested by "X. X."—The other Plans are left with our publishers, to be returned to their respective owners when called for.—ED.]

NO. 10.—STEAM ENGINE CHIMNEYS.

SIR,—One of your Correspondents, some time since, having expressed a desire to get some information respecting Steam Engine Chimneys, I beg leave to submit a few remarks for his consideration. I believe the stacks, or engine chimneys, in Cornwall, till very recently, did not exceed sixty feet in height, and these chimneys are generally made circular, both internally and externally. Round stacks are certainly stronger than square ones, and equally good, if not superior, in point of draught. I suppose, your Correspondent of St. Anstel (p. 271, vol. ii.) was not aware that there is a stack executed at Wheal Sparrow Mine, near Redruth, by the order of John Taylor, Esq. 122 feet above the level of the surface. The orifice, or draught-hole, is seven feet diameter at the bottom, and five feet at the top, Perhaps the draught would have been better, had the diameter continued of the same size from bottom to top, or increased with the height. Now, whether the additional height is more than commensurate to the expense of erection, I believe, has not been yet ascertained in this country; and when it is, you may, perhaps, hear from me again on the subject.

A MINER.

——, near Redruth, Cornwall.

CORRESPONDENCE.

An Amateur wishes to know "where he can get models of Mr. Watts' Single Engine and Double Engine (Figs. 26 and 27 in Mr. Stuart's Historical Description of the Steam Engine,) and what would be their cost?"

Communications received from—"A Friend" at Harpurley—W. W—t—T.C.B.—Thomas North—Nathan Short—F. S.—Aurum—R.B.P.—George Abbot—James Yule—R.B.L.H.—L.A.J.—X.D.—J.T.H—d—Philpot—W.V.M.—Telos—N. Wales—A.R.

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